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☐ 1. Document ID: US 20050205108 A1

L10: Entry 1 of 7 File: PGPB Sep 22, 2005

PGPUB-DOCUMENT-NUMBER: 20050205108
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20050205108 A1

TITLE: Method and system for immersion lithography lens cleaning

PUBLICATION-DATE: September 22, 2005

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Chang, Ching-Yu	Yen-Sun		TW
Lin, Chin-Hsiang	Hsin-Chu		TW

US-CL-CURRENT: 134/1; 355/53

ABSTRACT:

A method and system for cleaning lens used in an immersion lithography system is disclosed. After positioning a wafer in the immersion lithography system, a light exposing operation is performed on the wafer using an objective lens immersed in a first fluid containing surfactant, wherein the surfactant reduces a likelihood for having floating defects adhere to the wafer and the objective lens.

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 2. Document ID: US 20040118809 A1

L10: Entry 2 of 7 File: PGPB Jun 24, 2004

PGPUB-DOCUMENT-NUMBER: 20040118809
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040118809 A1

TITLE: Microscale patterning and articles formed thereby

PUBLICATION-DATE: June 24, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Chou, Stephen Y.	Princeton	NJ	US
Zhuang, Lei	Princeton	NJ	US

US-CL-CURRENT: 216/40

ABSTRACT:

The present invention is directed to a lithographic method and apparatus for creating micrometer sub-micrometer patterns in a thin film coated on a substrate. The invention utilizes the self-formation of periodic, supramolecular pillar arrays (49) in a melt to form the patterns. The self-formation is induced by placing a plate or mask (35) a distance above the polymer films (33). The pillars bridge the plate and the mask, having a height equal to the plate-mask separation and preferably 2-7 times that of the film's initial thickness. If the surface of the mask has a protruding pattern, the pillar array is formed with the edge of the pillar array aligned to the boundary of the mask pattern.

☐ 3. Document ID: US 20020042027 A1

L10: Entry 3 of 7 File: PGPB Apr 11, 2002

PGPUB-DOCUMENT-NUMBER: 20020042027
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020042027 A1

TITLE: Microscale patterning and articles formed thereby

PUBLICATION-DATE: April 11, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Chou, Stephen Y.	Princeton	NJ	US
Zhuang, Lei	Princeton	NJ	US

US-CL-CURRENT: 430/322; 430/330

ABSTRACT:

The present invention is directed to a lithographic method and apparatus for creating micrometer, more particularly sub-micrometer patterns in a thin film coated on a substrate. The present invention utilizes the self-formation of periodic, supramolecular (micrometer scale) pillar arrays in a thin melt to form the patterns. The self-formation was induced by placing a second plate or mask a distance above the polymer film. The pillars bridge the plate and the mask, having a height equal to the plate-mask separation (preferably 2-7 times that of the film's initial thickness). If the surface of the mask has a protruding pattern (e.g., a triangle or rectangle), the pillar array is formed with the edge of the pillar array aligned to the boundary of the mask pattern.

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWMC | Draw De

☐ 4. Document ID: US 6872014 B1

L10: Entry 4 of 7 File: USPT Mar 29, 2005

US-PAT-NO: 6872014
DOCUMENT-IDENTIFIER: US 6872014 B1

TITLE: Method for developing a photoresist pattern

DATE-ISSUED: March 29, 2005

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Paxton; Theodore A.	Chandler	AZ		
Davis; Todd	Gilbert	AZ		

US-CL-CURRENT: 396/567; 118/52, 396/604, 396/611, 396/626, 430/30

ABSTRACT:

The present invention relates to a method for developing a photoresist pattern. The method consists of mixing a concentrated chemical solution with a solvent to obtain a diluted chemical solution of a predetermined concentration. In this method, the mixing is done in a fabrication facility where the substrates are processed. The diluted chemical solution is then applied onto the photoresist pattern. Analysis of the pattern is then carried out to detect any defects or pattern collapse on the substrate. In the event that defects and/or pattern collapse occur, the predetermined concentration is adjusted to reduce the phenomenon.

21 Claims, 6 Drawing figures
Exemplary Claim Number: 1
Number of Drawing Sheets: 6

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWMC | Draw De

☐ 5. Document ID: US 6713238 B1

L10: Entry 5 of 7 File: USPT Mar 30, 2004

US-PAT-NO: 6713238
DOCUMENT-IDENTIFIER: US 6713238 B1

TITLE: Microscale patterning and articles formed thereby

DATE-ISSUED: March 30, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY

Chou; Stephen Y.	Princeton	NJ	08540
Zhuang; Lei	Princeton	NJ	08540

US-CL-CURRENT: 430/322; 264/299, 427/271, 427/472, 428/338, 430/311, 430/313, 430/330

ABSTRACT:

The formation of self-assembled patterns in a substrate through deformation induce by a mask placed above the substrate are disclosed. Methods of the present invention may be used to form arrays of nanometer sized pillars as well as mesas from a thin deformable layer of the substrate or a thin film of material deposited on the substrate.

22 Claims, 54 Drawing figures
Exemplary Claim Number: 1
Number of Drawing Sheets: 15

☐ 6. Document ID: US 6472023 B1

L10: Entry 6 of 7 File: USPT Oct 29, 2002

US-PAT-NO: 6472023
DOCUMENT-IDENTIFIER: US 6472023 B1

TITLE: Seed layer of copper interconnection via displacement

DATE-ISSUED: October 29, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Wu; Yang	Hsinchu			TW
Wan; Chi-Chao	Hsinchu			TW

US-CL-CURRENT: 427/430.1; 205/125, 205/126, 205/184, 205/85, 257/E21.174, 257/E21.584, 427/301, 427/304, 427/97.2, 427/97.7, 427/99.5

ABSTRACT:

A process for the fabrication of submicron copper interconnection useful on IC structures without deposition of copper seed is described. A dense metal layer can be deposited through contact displacement reaction between diffusion barrier layer and metal ions in solution under appropriate conditions. The metal layer formed by the displacement deposition can serve as the conducting material for subsequent copper electroplating. Moreover, the costly process for applying seed layer through CVD or PVD can be eliminated.

10 Claims, 13 Drawing figures
Exemplary Claim Number: 1
Number of Drawing Sheets: 5

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWMC | Draw De

☐ 7. Document ID: US 6443811 B1

L10: Entry 7 of 7 File: USPT Sep 3, 2002

US-PAT-NO: 6443811
DOCUMENT-IDENTIFIER: US 6443811 B1

TITLE: Ceria slurry solution for improved defect control of silicon dioxide chemical-mechanical polishing

DATE-ISSUED: September 3, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Nojo; Haruki	Kanagawa-Ken			JP
Pandey; Sumit	Boston	MA		
Stephens; Jeremy	New Windsor	NY		
Ramachandran; Ravikumar	Ossining	NY		

US-CL-CURRENT: 451/41; 257/E21.244, 451/287, 451/288, 451/36, 451/60, 51/308, 51/309

ABSTRACT:

An aqueous based ceria slurry system and method for chemical mechanical polishing of semiconductor wafers, the slurry comprising less than 5 wt % abrasive cerium oxide particles and up to about the critical micelle concentration of a cationic surfactant, absent other abrasives, in a neutral to alkaline pH solution is disclosed. Also disclosed is slurry comprising a blend of surfactants including a pre-existing amount of anionic surfactant and an added amount of cationic and/or non-ionic surfactant.

15 Claims, 7 Drawing figures
Exemplary Claim Number: 1
Number of Drawing Sheets: 3

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWMC | Draw De

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Term	Documents
LITHOGRAPH$	0
LITHOGRAPH	1238
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☐ 1. Document ID: US 20050205108 A1

L11: Entry 1 of 1 File: PGPB Sep 22, 2005

PGPUB-DOCUMENT-NUMBER: 20050205108
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20050205108 A1

TITLE: Method and system for immersion lithography lens cleaning

PUBLICATION-DATE: September 22, 2005

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Chang, Ching-Yu	Yen-Sun		TW
Lin, Chin-Hsiang	Hsin-Chu		TW

US-CL-CURRENT: 134/1; 355/53

ABSTRACT:

A method and system for cleaning lens used in an immersion lithography system is disclosed. After positioning a wafer in the immersion lithography system, a light exposing operation is performed on the wafer using an objective lens immersed in a first fluid containing surfactant, wherein the surfactant reduces a likelihood for having floating defects adhere to the wafer and the objective lens.

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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Term	Documents
LENS	333915
LENSES	150203
(10 AND LENS).PGPB,USPT.	1
(L10 AND LENS).PGPB,USPT.	1

L13: Entry 1 of 11 File: PGPB Jan 4, 2007

PGPUB-DOCUMENT-NUMBER: 20070004182
PGPUB-FILING-TYPE:
DOCUMENT-IDENTIFIER: US 20070004182 A1

TITLE: Methods and system for inhibiting immersion lithography defect formation

PUBLICATION-DATE: January 4, 2007

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Chang; Ching-Yu	Yilang City		TW
Lin; Burn Jeng	Hsin-Chu		TW

US-CL-CURRENT: 438/478; 438/947

CLAIMS:

1. A method for performing immersion lithography, comprising: coating one or more surfaces of an immersion lithography system with a hydrophilic coating, the one or more surfaces for containing an immersion fluid; providing the immersion fluid to the immersion lithography system; performing immersion lithography on a resist-coated substrate using the immersion lithography system with the one or more hydrophilic coated surfaces.

2. The method of claim 1 wherein the hydrophilic coating is selected from the group consisting of: (i) silicon dioxide; (ii) polytetrafluoroethylene; (iii) fluoride; (iv) polyethylene; (v) polyvinylchloride; (vi) polymers of at least one of the materials (i)-(v) above; (vii) alloys of at least one of the materials (i)-(v) above; and (viii) combinations containing at least one of the materials (i)-(v) above.

3. The method of claim 1 wherein the resist-coated substrate is a semiconductor wafer.

4. The method of claim 1 wherein the immersion lithography system includes a wafer stage, an immersion fluid holder, and a lens, and at least a portion of the immersion fluid holder is coated with the hydrophilic coating.

5. The method of claim 4 wherein each of the wafer stage, immersion fluid holder, and lens are coated with the hydrophilic coating.

6. The method of claim 4 further comprising: cleaning at least a portion of at least one of the wafer stage, the immersion fluid holder, and the lens of the immersion exposure apparatus after performing the immersion lithography.

7. The method of claim 4 further comprising: cleaning at least a portion of at least one of the wafer stage, the immersion fluid holder, and the lens of the

immersion exposure apparatus when a value sensed by a sensor exceeds a predetermined threshold.

8. The method of claim 4 further comprising: cleaning at least a portion of at least one of the wafer stage, the immersion fluid holder, and the lens of the immersion exposure apparatus using a chemical cleaning solution and a surfactant solution.

9. The method of claim 8, wherein the chemical cleaning solution includes at least one of ammonia, hydrogen peroxide, ozone, sulfurous acid, and compositions thereof.

10. The method of claim 8, wherein the surfactant solution includes at least one of an ionic surfactant and a non-ionic surfactant.

11. An immersion lithography system comprising: an immersion fluid containment chamber including a plurality of surfaces; an immersion fluid positioned in the immersion fluid containment chamber; a substrate stage positioned within the immersion fluid chamber; a lens; and a reduced-contaminate-adhesion coating applied to one or more of the plurality of surfaces.

12. The immersion lithography system of claim 11 wherein the reduced-contaminate-adhesion coating is selected from the group consisting of: (i) silicon dioxide; (ii) polytetrafluoroethylene; (iii) fluoride; (iv) polyethylene; (v) polyvinylchloride; (vi) polymers of at least one of the materials (i)-(v) above; (vii) alloys of at least one of the materials (i)-(v) above; and (viii) combinations containing at least one of the materials (i)-(v) above.

13. The immersion lithography system of claim 11 wherein the substrate stage is configured for holding a resist-coated semiconductor wafer.

14. The immersion lithography system of claim 11 further comprising: a reduced-contaminate-adhesion coating applied to at least a portion of the substrate stage.

15. The immersion lithography system of claim 11 further comprising: a reduced-contaminate-adhesion coating applied to at least a portion of the lens.

16. The immersion lithography system of claim 11 further comprising: a mechanism for providing a cleaning solution to the immersion fluid containment chamber.

17. The immersion lithography system of claim 16 further comprising: a sensor for detecting when the cleaning solution should be provided to the immersion fluid containment chamber.

18. The immersion lithography system of claim 16, wherein the cleaning solution includes at least one of ammonia, hydrogen peroxide, ozone, sulfurous acid, and compositions thereof.

19. The immersion lithography system of claim 16, wherein the cleaning solution includes at least one of an ionic surfactant and a non-ionic surfactant.

20. An immersion lithography system comprising: an immersion fluid holder for containing an immersion fluid; a stage for positioning a resist-coated semiconductor wafer in the immersion fluid holder; a sensor proximate to the immersion fluid holder; and a lens proximate to the immersion fluid holder and positionable for projecting an image through the immersion fluid and onto the resist-coated semiconductor wafer; wherein the immersion fluid holder includes a coating configured to reduce contaminate adhesion from contaminates in the

immersion fluid.

21. The immersion lithography system of claim 20, wherein the coating includes a property for increasing a wettability of a surface of the immersion fluid holder that is adjacent to the immersion fluid.

22. An apparatus comprising: a plurality of components collectively operable to perform immersion lithography, the plurality of components including one or more components selected from the group consisting of: a wafer stage, an immersion fluid holder, a sensor, and a lens; wherein at least a portion of at least one of the plurality of immersion exposure apparatus components has an exterior coating configured to have a contact angle larger than about 50 degrees.

23. The apparatus of claim 22, wherein the coating is selected from the group consisting of: (i) silicon dioxide; (ii) polytetrafluoroethylene; (iii) fluoride; (iv) polyethylene; (v) polyvinylchloride; (vi) polymers of at least one of the materials (i)-(v) above; (vii) alloys of at least one of the materials (i)-(v) above; and (viii) combinations containing at least one of the materials (i)-(v) above.

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